

Claims

- [c1] An electrochemical cell comprising an aluminum anode spaced from an alkali metal peroxide cathode by an electrically insulating barrier.
- [c2] The electrochemical cell of claim 1, further comprising an electrolyte solution, the anode and the cathode positioned within the electrolyte solution.
- [c3] The electrochemical cell of claim 1, wherein the alkali metal peroxide cathode further comprises a metal electrode and sodium peroxide.
- [c4] The electrochemical cell of claim 3, wherein the sodium peroxide is enclosed in fiberglass cloth and is positioned such that upon dissolution, the sodium peroxide passes through the metal electrode.
- [c5] The electrochemical cell of claim 3, wherein the sodium peroxide employed in the cathode is solid granular sodium peroxide.
- [c6] The electrochemical cell of claim 3, wherein the metal electrode employed in the cathode is woven silver plated copper wire.

- [c7] The electrochemical cell of claim 1, wherein the aluminum employed in the anode is at least 99.999% pure aluminum.
- [c8] The electrochemical cell of claim 2, wherein the electrolyte solution is potassium chloride.
- [c9] The electrochemical cell of claim 2, wherein the electrolyte solution is potassium hydroxide.
- [c10] The electrochemical cell of claim 1, wherein the electrically insulating barrier is a membrane of fiberglass cloth located between the cathode and the anode to restrict direct contact.
- [c11] The electrochemical cell of claim 1, further comprising an activator, the activator added to contact the cathode of the cell to initiate the electrochemical reaction within the electrochemical cell.
- [c12] The electrochemical cell of claim 11, wherein the activator is water.
- [c13] The electrochemical cell of claim 11, wherein the activator is an aqueous hydroxide solution.
- [c14] The electrochemical cell of claim 11, wherein the activator is an aqueous salt solution.

- [c15] The electrochemical cell of claim 11, wherein the activator is potassium chloride.
- [c16] The electrochemical cell of claim 1, wherein an electrode bulk surface area of the cathode and an electrode bulk surface area of the anode are substantially stoichiometrically matched to satisfy diffusion of ions and to minimize side reactions forming hydrogen and oxygen gases.
- [c17] The electrochemical cell of claim 16, wherein the ratio of the electrode bulk surface area of the anode to the electrode bulk surface area of the cathode is between 23% and 40%.
- [c18] An electrochemical cell comprising an anode having an electrode bulk surface area and a cathode having an electrode bulk surface area, wherein the electrode bulk surface area of the anode and the electrode bulk surface area of the cathode are substantially stoichiometrically matched to satisfy diffusion of ions and to minimize side reactions.
- [c19] The electrochemical cell of claim 18, wherein the ratio of the electrode bulk surface area of the anode to the electrode bulk surface area of the cathode is between 23% and 40%.

- [c20] The electrochemical cell of claim 18, wherein the anode is comprised of aluminum.
- [c21] The electrochemical cell of claim 18, wherein the cathode is comprised of air.
- [c22] The electrochemical cell of claim 18, wherein the cathode is comprised of hydrogen peroxide.
- [c23] The electrochemical cell of claim 18, wherein the cathode is comprised of sodium peroxide.
- [c24] An electrochemical cell comprising an aluminum anode spaced from a sodium peroxide cathode by an electrically insulating barrier, the anode having an electrode bulk surface area and a cathode having an electrode bulk surface area, wherein the electrode bulk surface area of the anode and the electrode bulk surface area of the cathode are substantially stoichiometrically matched to satisfy diffusion of ions and to minimize side reactions.
- [c25] The electrochemical cell of claim 24, further comprising an electrolyte solution, the anode and the cathode positioned within the electrolyte solution.
- [c26] The electrochemical cell of claim 24, wherein the sodium peroxide cathode further comprises a metal electrode and sodium peroxide.

- [c27] The electrochemical cell of claim 26, wherein the sodium peroxide is enclosed in fiberglass cloth and is positioned such that upon dissolution, the sodium peroxide passes through the metal electrode.
- [c28] The electrochemical cell of claim 26, wherein the sodium peroxide employed in the cathode is solid granular sodium peroxide.
- [c29] The electrochemical cell of claim 26, wherein the metal electrode employed in the cathode is woven silver plated copper wire.
- [c30] The electrochemical cell of claim 24, wherein the aluminum employed in the anode is at least 99.999% pure aluminum.
- [c31] The electrochemical cell of claim 25, wherein the electrolyte solution is potassium chloride.
- [c32] The electrochemical cell of claim 25, wherein the electrolyte solution is potassium hydroxide.
- [c33] The electrochemical cell of claim 24, wherein the electrically insulating barrier is a membrane of fiberglass cloth located between the cathode and the anode to restrict direct contact.

- [c34] The electrochemical cell of claim 24, further comprising an activator, the activator added to contact the cathode of the cell to initiate the electrochemical reaction within the electrochemical cell.
- [c35] The electrochemical cell of claim 34, wherein the activator is water.
- [c36] The electrochemical cell of claim 34, wherein the activator is an aqueous hydroxide solution.
- [c37] The electrochemical cell of claim 34, wherein the activator is an aqueous salt solution.
- [c38] The electrochemical cell of claim 34, wherein the activator is potassium chloride.
- [c39] The electrochemical cell of claim 16, wherein the ratio of the electrode bulk surface area of the anode to the electrode bulk surface area of the cathode is between 23% and 40%.
- [c40] The electrochemical cell of claim 16, wherein the chemical reaction further comprises $2\text{Al}_{(s)} + 3\text{Na}_2\text{O}_{2(s)} + 6\text{H}_2\text{O} \rightarrow 2\text{NaAl(OH)}_{4(aq)} + 4\text{NaOH}_{(aq)}$.
- [c41] An electrochemical cell comprising a metal anode spaced from an alkali metal peroxide cathode by an electrically insulating barrier.

[c42] The electrochemical cell of claim 41, wherein an electrode bulk surface area of the cathode and an electrode bulk surface area of the anode are substantially stoichiometrically matched to satisfy diffusion of ions and to minimize side reactions forming hydrogen and oxygen gases.